

MANAGEMENT OF PERIPHERAL VASCULAR DISEASE

*Transcription of a Panel Meeting on Therapeutics**

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MODERATOR IRVING S. WRIGHT: In considering how to present the management of peripheral vascular disease, it seemed clear that there were many questions which should be discussed by the panel. We shall try to do this in an informal manner. When confronted with a person with occlusive vascular disease, we must first ask ourselves what we wish to accomplish. In order to determine this we must establish a diagnosis. We must determine whether there is an arterial or a venous occlusion. Sometimes both arteries and veins are involved. Was the occlusion gradual or sudden? Was it due to atherosclerosis, thromboangiitis obliterans, Raynaud's phenomenon, or an embolic closure? Was it due to thrombophlebitis with reflex arterial spasm? Was it due to external pressure such as a cervical rib or a hyperabduction syndrome, or a tumor? There are many other possibilities to be considered.

We must then determine the status of the circulation. Is there moderate ischemia, producing intermittent claudication, is it more serious, with impending gangrene, or is there actual gangrene present? Is there infection? Is edema present? We must search for underlying diseases which must be treated. Does the patient have polycythemia vera which tends to increase the likelihood of thrombosis and hemorrhage in both arterial and venous trees, thromboangiitis obliterans, or diabetes mellitus? Does he have atrial fibrillation with mural thrombi and possible embolization? The treatment to be considered must be physiologically sound.

Even such simple questions as the advisability of rest for the affected part are at present subject to a critical re-evaluation. Dr. Foley, do you place the patient at complete rest? In what position should the foot be maintained? How long should the rest continue? How do you determine when to allow the patient to be active? Does weight-bearing do harm or good? Will you answer a few of these questions?

DR. WILLIAM T. FOLEY: I think the key to the answer is contained in your own statement, made a moment ago, when you said that any treatment must be based on sound physiological grounds. What are we trying to do in the patient with arterial occlusion? Of course we are trying to increase the blood flow. On the one hand, inactivity may have the beneficial effect of placing the part at rest and we know that any pathological lesion heals better if it is at rest. Even when one has a sore finger, it heals better if one puts it in a splint, or if a lung has a lesion such as tuberculosis, we put the patient at rest and minimize the excu-

sion of the lung by pneumothorax or some such measure. On the other hand, resting an extremity leads to disuse and disuse in all living things is associated with atrophy. When in bed, the skin, bone and blood vessels atrophy. In a patient with normal circulation, when confined to bed, the nails cease growing, the hair does not grow, the bones lose calcium, the vessels themselves shrink and one gets decreased blood flow. Where is the compromise between these two factors, rest and use?

I think if one can put the afflicted tissue itself at rest by using a bandage or a splint, and can get the patient up and walking, one then has the optimum physiological urge for blood flow. We find that a patient at rest, compared to a patient who walks, say, 100 yards, has a considerably reduced blood flow; the rate of blood flow down the iliac artery can be augmented more than ten times if he walks 100 yards. There is no modality among all of our therapeutic facilities, either sympathectomy or sympathetic block or drugs, or any other measure that can increase the blood flow as markedly as exercise does.

MODERATOR WRIGHT: *Dr. Foley, does the presence of infection with drainage of purulent discharge influence you?*

DR. FOLEY: I think it does, definitely. If one has a spreading gangrene, then the motion of the part involved in having the patient walk may tend to spread the lesion and for that reason we have been hesitant to have these patients walk, but if we have a demarcated gangrene, then we do have the patients get up.

MODERATOR WRIGHT: *Bear weight?*

DR. FOLEY: Bear weight on the foot.

MODERATOR WRIGHT: Dr. Lord!

DR. JERE W. LORD, JR.: I should like to refer to a point that Dr. Foley alluded to earlier. At first there is acute deprivation of arterial flow to the lower extremity. Certainly at the very beginning, other than to establish the cause of this deprivation, one should use rest and should use it wisely. It has been pointed out many times that one of the harmful things that some of us might do is to elevate the part, to put it at rest on a pillow. It has been brought out that gravity is one of the best friends we have to encourage blood flow to that part. Therefore to obtain the effect of gravity, it would require lowering the part deprived of blood. It is better to raise the head of the bed on blocks rather than to gatch the bed or to put it in mid-Fowlers position. Raising the head of the bed 6 or 8 inches brings the heart level with the toes and gradually

encourages the blood to flow through the collateral circulation. A much better method, if one has such equipment available, is the properly operated oscillating bed. When handled properly, so the foot of the bed is lower than the head during part of the cycle, it is a useful device. The poorly operated oscillating bed may be worse than not using it at all.

MODERATOR WRIGHT: We are still seeing patients, and Dr. Foley currently has one under his care, who have a painful foot due to a sudden arterial occlusion. Dr. Foley found that the patient's doctor had elevated the foot on a pillow. For this condition this is the worst sort of treatment. It is the opposite of what should be done. With arterial blockage, the foot should be kept below the heart level to encourage the flow of blood to the extremity. On the other hand, if you have good arterial circulation and you have venous obstruction with swelling of the foot, elevation of the foot of the bed is indicated. This is just common sense. It is just a physiological principle. The oscillating bed is the best form of therapy that we have for this problem. It not only results in flow of blood, but it also aids in retaining calcium in the bones and, to a remarkable degree, gives the person passive exercise 24 hours a day, which is very important in the care of these patients.

The next question deals with the use of heat. Heat has been used very improperly. We have now seen nearly 100 patients who have been badly burned, some of them developing gangrene and in some amputation has been unavoidable due to misapplication of diathermy, infra red lamps, hot water bags or other forms of heat directly to the foot. This is especially serious in patients with diabetes where a peripheral neuritis has resulted in anesthesia of the foot. These patients are often not aware that the foot is being burned until very serious damage has been done.

Dr. Mendlowitz, how do you use heat, or do you use it?

DR. MILTON MENDLOWITZ: We do not use direct heat at all in the treatment of a patient with occlusive arterial disease. There is reason, in some cases, to use what is called reflex heat. This is heat applied not to the affected limb itself but to the trunk or to an arm in order to produce reflex vasodilatation and get whatever inhibition of sympathetic nerve discharge can be obtained in this way. This can be done by the use of a cradle baker over the trunk, for example. It is only useful where some degree of neurogenic vasospasm can be demonstrated, and in acute occlusion that is usually in the beginning or immediately after the event

has taken place. In the later phases of this condition, vasospasm, if it is present at all, is not the important factor that it is in the early stage of the embolization.

MODERATOR WRIGHT: *Are there any further comments on the question of heat, Dr. Foley?*

DR. FOLEY: A warm tub bath with the temperature of the water carefully controlled so that it is not above body temperature is a very valuable adjunct.

MODERATOR WRIGHT: We are now going to talk about the sympathetic nervous system. This can be divided into three phases: First, there is the question of sympathetic blocks. Should sympathetic blocks be used or not used for an acute occlusion? What are the indications and the contraindications? The second part is the question of surgical sympathectomy, and the third part, the question of the use of drugs which attempt to produce a non-surgical sympathectomy.

Dr. Lord, will you open the discussion of the use and the misuse of sympathetic blocks?

DR. LORD: In any patient who has acute arterial occlusion, the first thing to do is to determine whether one can relieve the occlusion, whether embolic or thrombotic or traumatic in origin. If we assume that we cannot relieve the obstruction by prompt surgical means, then intervention on the sympathetic system must be considered. It may be employed in two ways with different purposes in mind. One will be to try to get rid of all vasospasm of that extremity, realizing that the usual medication such as procaine or xylocaine, will last only a few hours. The second purpose is to use it as a diagnostic procedure as a prelude to sympathectomy.

If, when the patient is first seen, you cannot do a direct surgical procedure on the occluded vessel, then a sympathetic nerve block may effect an immediate break of the vasospasm and anticoagulants can be started. After the anticoagulant is started, however, I personally feel extremely reluctant about carrying out further blocks on the sympathetics because if hemorrhage occurs, it may not be recognized for some time or if recognized, it may be difficult to control. We will then use the reflex heat which Dr. Mendlowitz has recommended.

MODERATOR WRIGHT: *Dr. Lord, is there any evidence that keeping a patient under reflex heat will prolong the effect of the block as compared with omitting the use of heat?*

DR. LORD: I don't know of any such evidence. On the other hand, it seems to me that, properly applied, reflex heat will do just about everything that a paravertebral block will do. The only drawback is that the block which gives a complete and immediate response is difficult to continue every six to eight hours, both for the patient and the physician, whereas the reflex heat can be carried out most satisfactorily by the nursing staff.

MODERATOR WRIGHT: *We will discuss sympathectomy a bit later but I have another question. It has been stated that the vasodilatation which takes place as the result of sympathectomy is almost entirely limited to the superficial vessels and that the deep vessels are not dilated. If this is true for sympathectomy, would it not be true for a sympathetic block and would this factor influence the selection of the cases in which you would use block?*

DR. LORD: In the acute stage I think we are all concerned with the integrity of the skin and hope to save the limb. We are not concerned about intermittent claudication because, for the moment, that has not even become a problem. Therefore I think the block or sympathectomy may be indicated to try to save the limb in the acute stage of arterial insufficiency. There are divergent opinions between medical men and surgeons with regard to the value of sympathectomy for intermittent claudication. I am one of the group which holds that there is no evidence that interruption of the sympathetic nervous system improves the blood flow to the muscle. I know of no clinical or experimental evidence that is incontrovertible, therefore I do not perform a lumbar sympathectomy on a patient who has intermittent claudication as his only symptom.

MODERATOR WRIGHT: *Dr. Mendlowitz, what do you do for your patient?*

DR. MENDLOWITZ: If there is occlusion of a large vessel and demonstrable vasospasm, and by that I mean that one can release this vasospasm and produce appreciable change in the temperature of the skin, or if other criteria for measuring blood flow, such as the plethysmograph, calorimeter or just palpation with the hand, indicate that there is vasospasm and this is an acute situation, then I think that sympathetic blockade is indicated to tide the patient over and save as much of the skin and of the limb as it is possible to save. I think that at this point the question could be interjected as to whether one could get more

of an effect in terms of increased blood flow by such a procedure as the intra-arterial injection of Priscoline, which is believed to act not only on the sympathetic nerves but also by dilating the capillaries themselves.

MODERATOR WRIGHT: *Dr. Mendlowitz, you have asked a question. Can you answer it?*

DR. MENDLOWITZ: I can only say that frequently one is faced with a situation in peripheral vascular disease in which the skin figuratively hangs in the balance and may be permanently compromised, where the femoral artery is patent, yet there is no occlusion above it. In such an instance, regardless of additional measures resorted to, such as sympathetic blockade, it is feasible to inject intra-arterially something in the nature of Priscoline, provided one is alert to the rare case in which Priscoline can *produce* an arterial thrombosis.

MODERATOR WRIGHT: *We have not opened the discussion of drugs yet, but you have mentioned Priscoline. What about histamine? It has been advocated by some workers.*

DR. MENDLOWITZ: That involves a more elaborate technique and requires setting up an arterial inflow system. It is not, in my opinion, very practical unless you have a rather elaborate team with continuous nursing and medical coverage.

MODERATOR WRIGHT: We will get to that a little later.

Dr. Foley, would you comment on sympathetic blocks.

DR. FOLEY: I think sympathetic block has the great advantage of pinpointing the vascular dilatation. One can limit it to the affected limb whereas many of our other measures are apt to produce dilatation in all four limbs and also in the trunk. It has the disadvantage that it should not be done if the patient is receiving anticoagulants.

Usually equally good results can be obtained with simpler measures such as sub-lingual nitroglycerin. When simpler measures fail, then we would use the block.

MODERATOR WRIGHT: *Dr. Lazzarini, do you have any comment?*

DR. ABEL A. LAZZARINI, JR.: Just to say that the sympathetic block has the disadvantage of lasting only a few hours and then it must be repeated in order to observe any appreciable effects.

MODERATOR WRIGHT: I think there are two points that we should emphasize. One is that if you are going to do sympathetic blocks, you should be prepared to do several, at six or eight hour intervals, in the

event that the first one does not succeed. I have seen some patients in whom the effect was negative after the first one but became pronounced after the second or third.

Secondly, the opinion has been expressed that it was unwise to do sympathetic blocks when a patient is on anticoagulant therapy. It is true that there have been several deaths reported as the result of this approach. However, just for the sake of being the devil's advocate, I would like to record that there are a number of workers who feel that this danger has been grossly over-stressed and that actually, if the block is done carefully and not in a traumatic way, it can be relatively free from danger.

Dr. Gerald Pratt has reported 2116 blocks in 554 patients on anti-coagulants without serious hemorrhage. It is his belief that serious hemorrhages are not due to simple puncture but to faulty technique resulting in torn vascular walls. This presents the other side of the coin.

Now we will discuss sympathectomy, a more drastic procedure. Some patients are not in very good shape for such an operation, yet this procedure must be considered. Dr. Lord, will you open this discussion?

DR. LORD: There are three situations in which sympathectomy is well worth considering. First, in the individual who has the acute occlusive lesion but is not amenable to direct arterial surgery after a block has produced marked improvement in a foot which was in jeopardy and in whom the symptoms have returned after the block wore off. If there is no contraindication to sympathectomy, it may then be valuable in the acute stage. I have had a number of patients of that type.

The second is in the individual who has had excellent medical care, in an attempt to improve a chronically deficient circulation to the limb, and yet the desired result has not been achieved; when there is still cyanosis of toes, rest pain, in addition to the original problem,—a patient who is not symptom free and in whom amputation is not indicated. In such a case sympathectomy may help after testing for vasomotor tone. Dr. Mendlowitz referred to this as “vasospasm”, but I prefer to use the term vasomotor tone since some of these patients manifest a degree of activity of the sympathetic nervous system which is subtle and should be studied in a constant temperature room under reduced temperature. Several methods can be used to break the tone

such as paravertebral block or reflex heat. The temperature of the skin of the toes should then be determined and should there be evidence of vasomotor tone, a sympathectomy may be of value.

Finally, sympathectomy may be helpful, after medical therapy has been proved to be inadequate, in those patients manifesting such functional disturbances as Raynaud's disease, reflex pneumatic hammer disease, the so-called reflex motor dystrophy.

MODERATOR WRIGHT: *Dr. Lord, I would like to have your opinion regarding the value of sympathectomy in the treatment of intermittent claudication.*

DR. LORD: Not infrequently one sees patients who have intermittent claudication and no other symptom such as rest pain, gangrene, or ulceration. They walk one or two blocks and have a cramp and stop, rest, walk again,—pain comes on walking and goes away with rest. Such a patient is often seen in consultation early in the course of his trouble. He probably suffered thrombosis of the femoral artery in the adductor canal. If early in his trouble a sympathectomy is performed, the walking distance will improve in a matter of weeks or months and surgery will take the credit. Such a patient, treated by medical management, will do equally as well as one treated by sympathectomy and in some instances will do better because the sympathectomy may take some of the blood away from the calf muscles and divert it to the superficial tissues. Other patients who have chronic intermittent claudication but who have not followed good medical advice may undergo lumbar sympathectomy. If, following that procedure, they follow and adhere to good medical measures, they will do better. My own experience, in private practice and on the Fourth Division of Bellevue Hospital, is that no patient with intermittent claudication has ever been helped by lumbar sympathectomy who has previously been on good medical regimen.

MODERATOR WRIGHT: *Dr. Mendlowitz, do you advise sympathectomy in the treatment of intermittent claudication?*

DR. MENDLOWITZ: No.

MODERATOR WRIGHT: *Dr. Foley, do you use it in the treatment of intermittent claudication?*

DR. FOLEY: No, I do not but may I just point out that I think Dr. Lord is a most unusual surgeon. He is a student of vascular disease and approaches this problem from a broad point of view. Many surgeons approach the sympathetic nervous system as they would the appendix

or the tonsils,—the indication for removal is because it is there. This may be a harsh statement but we have seen hundreds of people who were subjected to sympathectomy for no apparent good reason. As Dr. Lord's studies have pointed out, the operation is not warranted in most cases of intermittent claudication.

MODERATOR WRIGHT: *Dr. Lazzarini, any comments?*

DR. LAZZARINI: No.

MODERATOR WRIGHT: It is bad enough to do a sympathectomy where it is not indicated, but it is even worse to do a sympathectomy and permit the patient to continue to smoke. Unfortunately this is a common situation. The surgeon does a sympathectomy without insisting that the patient stop smoking. Some of these patients have the feeling that they are protected because of the sympathectomy. Therefore they continue to smoke, despite the advice of other physicians.

Many of these patients have arterial occlusion because of an embolus, often released from a heart in fibrillation. This complication may involve any organ. It must be decided whether or not an attempt should be made to remove the occlusion by surgery. If the decision is for surgery, it should be acted upon promptly.

Dr. Lord, how do you decide on which cases you will attempt an embolectomy?

DR. LORD: I think this is the same problem that we face so often in the practice of the various branches of medicine and surgery. If we could make and follow hard and fast rules, the problem would be much simpler. One has to select,—select that therapy, whether medical or surgical, which is most appropriate for a particular patient, or conversely, select only those patients who are likely to benefit from a specific form of treatment. That selection is often a difficult decision to make. In a general way the following has been our experience: I have yet to do my first embolectomy in the upper extremity. We have seen quite a number of patients who, we believe, had a bona fide embolus to the subclavian, the auxiliary, the brachial artery or below and none of those patients has lost any tissue when treated medically by the means outlined earlier. I have heard of individuals whose hand has gone on to gangrene and I have heard of other surgeons who believe that they have saved an upper extremity by embolectomy. The lower extremity is quite a different problem. I believe the following to be correct: Any saddle embolus, unless clear-cut contraindication exists, should be treated

immediately by surgery.

MODERATOR WRIGHT: *This is at the lower end of the aorta?*

DR. LORD: At the bifurcation of the aorta, embolectomy should be done promptly. Other than getting the patient to the hospital, relieving pain, and treating the heart as best one can, one should operate as soon as possible. Nothing should be done before operation to determine what the effect of a paravertebral block might be.

When one has the same condition at the bifurcation of the common iliac or the bifurcation of the common femoral, prompt embolectomy is mandatory. When embolism occurs lower in the extremity, in the superficial femoral or popliteal arteries, then evaluation of the situation in the individual patient must be observed. I personally have never done a popliteal embolectomy. I do not believe we could ever have helped any patient we have seen. That is not the experience of a number of surgeons. They believe popliteal embolectomy may be strongly indicated. In some instances it may be so. Usually I have operated on the lower abdominal aorta and on the major arteries of the upper thigh and have been conservative elsewhere.

MODERATOR WRIGHT: *Dr. Foley, you have seen many patients with emboli in your day. Do you have further comments?*

DR. FOLEY: I agree completely. I would not change a word.

MODERATOR WRIGHT: *Dr. Mendlowitz!*

DR. MENDLOWITZ: I agree.

MODERATOR WRIGHT: *Dr. Lazzarini!*

DR. LAZZARINI: I agree.

MODERATOR WRIGHT: I agree, too. This is a sound way to approach this situation. Now to consider the problem of small vessels. I have seen emboli removed from the popliteal artery, not by Dr. Lord, but by others, only to have the vessel thrombose again rather promptly. In addition to the embolus or thrombosis with which the patient started, you have traumatized tissue. The circulation of the peripheral and collateral vessels has been interrupted and the operation has actually done more harm than good.

We will now discuss grafts. Dr. Lazzarini has, in recent years, been studying the problem of grafts. We shall ask him to open the discussion on this subject.

DR. LAZZARINI: I think that a summary of the problem of vascular grafting lies in the answers to two main questions. The first question is:

What type of graft is to be used? The second: In what type of patient should the graft be done?

Regarding the type of graft to be used, considerable study has been devoted in recent years to the possibility of using artificial prosthetic replacements of blood vessels, in other words, man-made blood vessels prepared and fashioned in the operating room. The reason for these studies has been the increasing difficulties in securing arterial homografts to be used in vascular surgery, namely, obtaining the proper donor at the proper time and the problem of preserving and maintaining adequate supplies in a blood vessel bank at all times.

A number of blood vessel banks have been established in many parts of the country during the past few years. It has been determined that the optimum age for donors of blood vessel grafts is between 15 and 35 years. These grafts should be taken, with or without sterile precautions, from patients who die of a known, non-transmissible disease. The main problem, of course, has been the question of the practicability of the technique, particularly in small communities.

In recent years considerable experience has accumulated in the use of grafts taken without sterile precautions and that have been sterilized by chemical or physical means in the laboratory and then preserved by various methods. These methods are, in general: freeze-drying techniques, quick freezing or preservation in a nutrient at 4° C. However, the problem of obtaining a sufficient number of donors' vessels of appropriate size at a given time is still present. Certainly the cooperation of the pathologists has helped a great deal but there are many places where these services are not available. It is for this reason that there is great interest in studying and experimenting with plastic prostheses. These are sheets or tubes of different kinds of plastic materials in the form of woven fabrics. These materials can be fashioned to proper size and shape and, after being sterilized just before use, can be implanted at any time. This method has considerable practical advantages over the use of natural prostheses such as homografts.

With natural prostheses, the autografts are taken from and transplanted into the same individual. The vessel is usually a vein graft and this procedure has proved very satisfactory in peripheral arterial disease. In the past few years considerable clinical experience has been obtained in the use of homografts, grafts taken from individuals of the same species. When used in peripheral vessels, however, the long-term results

have not been satisfactory. Finally, heterografts, or grafts taken from individuals of different species, for replacement of central or peripheral vessels have not been successful as yet. Although the practicability of using grafts from the animal kingdom should certainly be investigated further, with the exception of autografts, natural and plastic prostheses are at present not satisfactory in the surgical management of peripheral vascular diseases.

MODERATOR WRIGHT: *To which vessels do you refer; how large or how small a vessel is suitable for grafting?*

DR. LAZZARINI: The main surgical experience has been with replacement in the thoracic and abdominal aorta. The smaller the size of the vessels the more difficult it is to obtain a permanent satisfactory result. Vessels smaller than the popliteal arteries are usually unsuitable for grafting, not only because of their size but also because of the likelihood of extension of the disease.

MODERATOR WRIGHT: *Are there any members of the panel who wish to add or take issue with this statement? Dr. Lazzarini has made a very sound statement on the technique of vascular grafting. The use of grafts is increasing, not only here but throughout the world. Another decade will probably show marked improvement in techniques and application.*

Vasodilating drugs: We cannot discuss every drug that has been used as a vasodilator. Merely listing them would take too long. Among those more commonly used are Priscoline, Roniacol, TEAC, alcohol, papaverine, procaine, Dibenzaline, histamine, etc.

I shall ask Dr. Mendlowitz to outline the broad principles underlying the current use of vasodilators having a general systemic effect in the treatment of arterial occlusion in the leg.

DR. MENDLOWITZ: One general principle to emphasize is that most vasodilators in current use are effective in the skin circulation. Very few vasodilators that I know of are demonstrably effective, despite the claims, in the deeper circulation. Therefore if one uses vasodilators with the intention of affecting the deeper circulation, that is, the circulation in muscle, or specifically for intermittent claudication, then one is not likely to be very successful. It should be remembered that intermittent claudication tends to improve spontaneously, especially after an acute event such as an acute occlusion.

For intermittent claudication, the logical type of vasodilator to use is one which, in addition to having its effect on the sympathetic nervous

system, also has an effect on the capillaries, a direct effect in dilating capillaries in addition perhaps to relaxing the smooth muscle of blood vessels. Priscoline and histamine are in this class and are widely used for this reason in peripheral vascular disease. I must confess that when it is used *orally* I am not at all convinced that its effect is demonstrable except in a rather small percentage of cases, despite the fact that we always use these drugs and despite the fact that I am also convinced that they are of some value. This is a very vague statement and I am afraid I cannot document it by data because it is based purely on clinical impression. However, such data as are available in the literature indicate that drugs which act both on the capillaries and on the sympathetic nervous system are apt to be more effective than those which act on the sympathetic nervous system alone, especially if one is interested in treating a process which is compromising the skin circulation.

As far as general vasodilators are concerned, they all have the defect which Dr. Foley pointed out, which is that they dilate all the blood vessels instead of confining the vasodilatation to the blood vessels which are specifically involved in a single extremity. For that reason, efforts directed at the limb by means of intra-arterial medication sometimes have a use.

MODERATOR WRIGHT: *Someone in the audience has raised the following question: What is the opinion of the panel regarding histamine infusions in the treatment of arterial occlusion? I am going to ask Dr. Foley to answer this first because several years ago he was assigned the task of analyzing this problem. We would like him to discuss his results.*

DR. FOLEY: First of all, I think histamine is in many ways the ideal vasodilator, at least on theoretical grounds. It is a natural substance. It is nature's own vasodilator. Its defects are that its action is fleeting as well as general. In an effort to eliminate the general action the idea has been advanced that one might inject the artery supplying the limb that needed the vasodilatation and thus perfuse the limb with histamine. If the drug is injected slowly into the artery it acts locally in the tissues and little of it reaches the venous side or into the systemic circulation to produce severe headache, a common reaction to histamine. The treatment consists in attaching a flask of saline to a needle in an artery to which histamine has been added. The advantage is that local vasodilatation results. In such extremely sensitive structures as arteries, if they are irritated or traumatized even to the slightest degree, spasm of the artery

itself is apt to be severe, and this is a real disadvantage. In experimental animals we have sometimes stuck needles into the femoral artery and produced such spasm that we could not pull the needle out again.

The second disadvantage is trauma to the artery. If the vessel is arteriosclerotic, a plaque may be rubbed off and embolus occur. We used this treatment in the clinic some years ago. This was before we came to the realization that blood flow and vasodilatation would be so greatly influenced by exercise. If the patient gets up and walks, a greater increase in blood flow would result than from an injection of histamine which would take two hours to administer.

MODERATOR WRIGHT: In other words, we are somewhat iconoclastic about the use of generalized vasodilators. When the entire blood vascular bed is dilated, or a very large portion of it, at one time, unless the blood volume is increased, it is hard to conceive how the blood flow to a leg or a foot that is painful and where the vessels are in spasm can be increased. Under such circumstances that extremity is that portion of the body that is most resistant to easy vasodilatation. Therefore the vessels of the rest of the body dilate more freely than in the involved area. This suggests that perhaps one actually decreases the blood flow in an affected limb.

DR. FOLEY: Could I put in a plug at this time for nitroglycerin? If one wants to release spasm of large vessels or medium sized vessels such as the radial, ulnar, femoral, or popliteal arteries, nitroglycerin has the most profound effect, is easiest to administer and has fewer side effects and dangers than any of the other vasodilators.

MODERATOR WRIGHT: *Is it not true, however, that this dilatation is confined to arteries and does not affect arterioles and capillaries?*

DR. FOLEY: Yes, sir. If one finds a fairly good pulse volume in the radial or ulnar, one won't get any increase in the warmth of the hand but if the patient is having a spasm at the moment, such as Raynaud's spasm and the fingers are white, one can get immediate release of this spasm with nitroglycerin and increased warmth of the fingers.

MODERATOR WRIGHT: *We shall now discuss the question of anti-coagulants. We shall not attempt a general discussion of anticoagulants because time does not permit. Dr. Foley, in the treatment of acute arterial occlusion, do you use anticoagulants or not and, if so, what do you use?*

DR. FOLEY: For acute occlusion, we use heparin for its immediate

effect, for the following reasons: First, to limit the propagation of the clot; second, to prevent thrombosis in situ, in the stagnant flow of blood in the capillary bed and veins; third, to prevent further embolization.

MODERATOR WRIGHT: *Dr. Mendlowitz, do you use anticoagulants?*

DR. MENDLOWITZ: We do. We use heparin for its effect in the acute stage and then we follow that by some member of the coumarin group.

MODERATOR WRIGHT: *Dr. Lord, do you have any further comments on this? Do you agree?*

DR. LORD: I agree.

MODERATOR WRIGHT: That is a fair summary of the reaction of this panel. A question which is frequently asked concerns the choice of anticoagulants. It is clear that most of us use heparin for the immediate effect. I think most of the members of this panel would agree that it does not make too much difference which of the coumarins or indanediones you use, providing you know how to use them. In other words, one may use Dicumarol, Hedulin, Tromexan or Marcumar or any of the others. Each has slight advantages or disadvantages according to what one tries to accomplish. If a physician knows how to use any one of these drugs he can obtain essentially the same desired effect.

The panel has permitted me to review a list of what we no longer consider to be essential therapy. If any one of the panel wishes to make a statement in reference to any of these modalities there will be opportunity to do so. We consider that the Pavex boot and the intermittent venous occlusion machine are now discarded therapy; that alphatocopherol, or vitamin E, is no longer used. The same may be stated regarding intravenous ether, histidine and ascorbic acid. The use of refrigeration to save a leg is unsound but refrigeration to prepare a leg for amputation is justified in some cases where a severe infection is present in an old diabetic. It may be used for a day or two, prior to amputation. The direct use of heat, of diathermy or heat pads should be discouraged.

Are there any comments regarding these statements? If there are none, we have time for a few questions. Here is the first question: Dr. Lazzarini, why do arterial homografts "take" whereas homografts of most other tissues do not?

DR. LAZZARINI: The idea of the vascular homograft surviving in the host is not correct in a biological sense. There is no demonstrable

viable homograft on any occasion. It has been shown to be nothing more than framework for the host cells to grow in, a sort of mechanical frame and it always will be replaced in a given time by the host vessel.

MODERATOR WRIGHT: *Dr. Mendlowitz, will you please discuss the value of Arlidin in occlusive arterial disease?*

DR. MENDLOWITZ: I cannot answer that specifically. I think it is of some value but no more so than other vasodilators in common use.

MODERATOR WRIGHT: *Dr. Foley!*

DR. FOLEY: I agree with that statement but I think it is a bit hedged. I would like to counter by asking, how often do you prescribe it?

DR. MENDLOWITZ: Very rarely.

MODERATOR WRIGHT: Today we have a choice of about 20 so-called vasodilators. For most of them, the evidence regarding their value in the treatment of arterial occlusion is very slim.

DR. LORD: In all honesty, Dr. Wright, there is no sense in prescribing any of them except that it makes you, as a doctor, feel you are doing something.

MODERATOR WRIGHT: As a matter of fact, that was the implication of my comment of a few minutes ago when I suggested that the affected limb was often the one which received the least increase in blood flow from any general vasodilator.

Dr. Foley, how do you use heparin and how do you control the dosage?

DR. FOLEY: For its immediate effect I use the heparin intravenously but only for the first dose. Since concentrated heparin is now easily obtainable, I use this subcutaneously. The average dose is 15,000 units for a 150 pound man and may be repeated every 12 hours. The coagulation time has to be controlled. A test is done before heparin is given. By the bedside technique that I use, the normal time is 4 to 6 minutes. Five hours after an appropriate subcutaneous dose of heparin the coagulation time should be tripled. I have also used this concentrated heparin for long-term administration in patients who did not respond to other types of anticoagulants. One patient has been kept on it for three months. He administers it to himself every 12 hours, just like a patient taking insulin.

MODERATOR WRIGHT: *Dr. Mendlowitz, do you advise the use of histamine iontophoresis locally over intact but affected skin?*

DR. MENDLOWITZ: No, sir.

MODERATOR WRIGHT: *Does any panel member?*

DR. LORD: No.

MODERATOR WRIGHT: *I will try to answer the next question: Are sympathectomized patients more sensitive to tobacco than before surgery?* My belief is that they are no more so but that they are just as sensitive as before operation. They certainly are no less sensitive.

Another question asks what is the status of the use of fibrinolysin, plasmin or streptokinase in the disintegration of clots and do they hold any promise for the future?

I think the use of all of these preparations is highly experimental at present. They are very interesting compounds, especially plasmin. We are doing some work with it. It is an extremely interesting substance but the lots that have been prepared commercially have not been well standardized and they have produced undesirable reactions. In using these very active substances, the question arises as to whether they present the risk of causing the breaking off and liberation into the circulation of loose emboli from the long slender tail of a thrombus. It is quite possible that these substances may prove useful but further experimental investigation is necessary before they are used in general practice.

Is there any difference of opinion in this regard? If not, Dr. Foley, how do you treat an ulcer of diabetic neuritis located on the sole of the foot?

DR. FOLEY: That is a real tough one, on the sole of the foot. First of all we have a podiatrist provide pads to shift the weight-bearing surface over to another area that is better able to stand it. Since these patients' tissues tend to atrophy when they are confined to bed, we keep them walking. We have used all the other modalities that have been mentioned today.

MODERATOR WRIGHT: *Dr. Lord, in the operation of lumbar sympathectomy, do you favor removal of the 1st, 2nd, 3rd and 4th lumbar ganglia?*

DR. LORD: That is a highly esoteric problem. This is an awful confession. We really don't know what we are doing. We take out all the ganglia we can get from the diaphragm down to where the iliac artery crosses over. Although it was strongly advised years ago to perform a preganglionic sympathectomy and not a postganglionic sympathectomy, this differentiation has largely been discarded at the present time. One does everything possible to remove the sympathetic nerves. Actually, sympathectomy under such conditions seems to be permanent in the

lower extremity. I don't think that is a problem.

MODERATOR WRIGHT: *Dr. Lord, some patients ask the following question before and some ask it after surgery: Does this type of sympathectomy affect the potency of the male?*

DR. LORD: If the operation is done bilaterally, the individual has everything he had before except the ability to ejaculate. It is the opinion of my chief, Dr. William Hinton, that most of the people who require this type of operation don't have to be concerned about that.

MODERATOR WRIGHT: Some of them do, though.

I shall try to answer the next question: How do you treat nocturnal calf pain?

We elevate the head of the bed six or eight inches. We use reflex heat, by putting a heating pad over the abdomen and encourage the person to use the muscles. There are several other things to do for night cramps. One is the use of quinine which frequently stops them although we really do not know why. I have been able to relieve a number of people of night cramps by teaching them the simple technique of stretching their legs with the heels extended instead of the toes extended. For some reason most people tend to stretch their legs with the toes extended and this may cause a tonic contraction of the calf muscles with accompanying cramp pain. It is also important to have the bed clothes loose at the foot of the bed. Many people suffer from cramps because they are too neat, they tuck the bed clothes in tightly thus binding the feet down and fatiguing the muscles by constant prolonged pressure. This is a common cause of cramps,—the treatment is simple and obvious.

One doctor's wife went to eight or ten doctors, including an orthopedist, and bought expensive shoes without any improvement. My only advice to her was to kick the bed clothes free. Her husband called up about two weeks later and said, "Life is heaven again. We have not slept this well in years." About four years later he came up to me at a medical meeting and said, "I want to tell you that you just changed our whole life." A strange way to acquire a patient's appreciation!

This concludes our panel meeting. Thank you all very much!